St Xavier s College , Ranchi

Study of weather instruments

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Introduction

The **India Meteorological Department (IMD)** is the principal agency responsible for meteorological observations, weather forecasting, and seismology in India. Established in **1875**, IMD operates under the **Ministry of Earth Sciences**, Government of India. Over the years, IMD has become one of the most important scientific organizations in the country, playing a crucial role in safeguarding lives, property, and economic activities from the effects of extreme weather and natural disasters.

IMD's services touch almost every sector of the Indian economy, including agriculture, aviation, shipping, defense, water management, and disaster preparedness. With a history spanning nearly 150 years, the department has grown into a sophisticated network of observatories, satellite monitoring systems, and modern forecasting technologies, making it one of the leading meteorological institutions in the world.

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Historical Background

The origins of IMD can be traced back to the British colonial period. In 1875, following a series of severe droughts and famines, the need for organized weather observation and forecasting became evident. **Henry Francis Blanford** was appointed as the first Imperial Meteorological Reporter, and thus the IMD was formally established. Its early focus was on collecting rainfall data and issuing seasonal forecasts, particularly related to the Indian monsoon.

Since then, the department has continuously evolved. The introduction of radar systems, satellite imagery, computer-based modeling, and Doppler weather radars has significantly improved the accuracy and reach of weather forecasts in India.

"Impact Based Weather Forecast"
INDIA METEOROLOGICAL DEPARTMENT

Functions and Responsibilities

IMD carries out a wide range of functions that are vital for the country:

1.Weather Forecasting and Warnings:

IMD provides short, medium, and long-range forecasts for weather conditions across India. It also issues timely warnings for cyclones, thunderstorms, heatwaves, and floods.

2.Climate Monitoring:

IMD monitors long-term weather patterns and maintains national climate records. It also contributes data for studying climate change and global warming.

3.Agricultural Meteorology:

The department provides agro-meteorological advisories to farmers, helping them plan agricultural operations like sowing, irrigation, and harvesting.

4.Aviation and Marine Services:

IMD supports the aviation and maritime sectors with specialized weather forecasts to ensure safety in air and sea travel.

5.Seismology:

IMD also maintains a national network of seismological stations to detect and monitor earthquake activity across India.

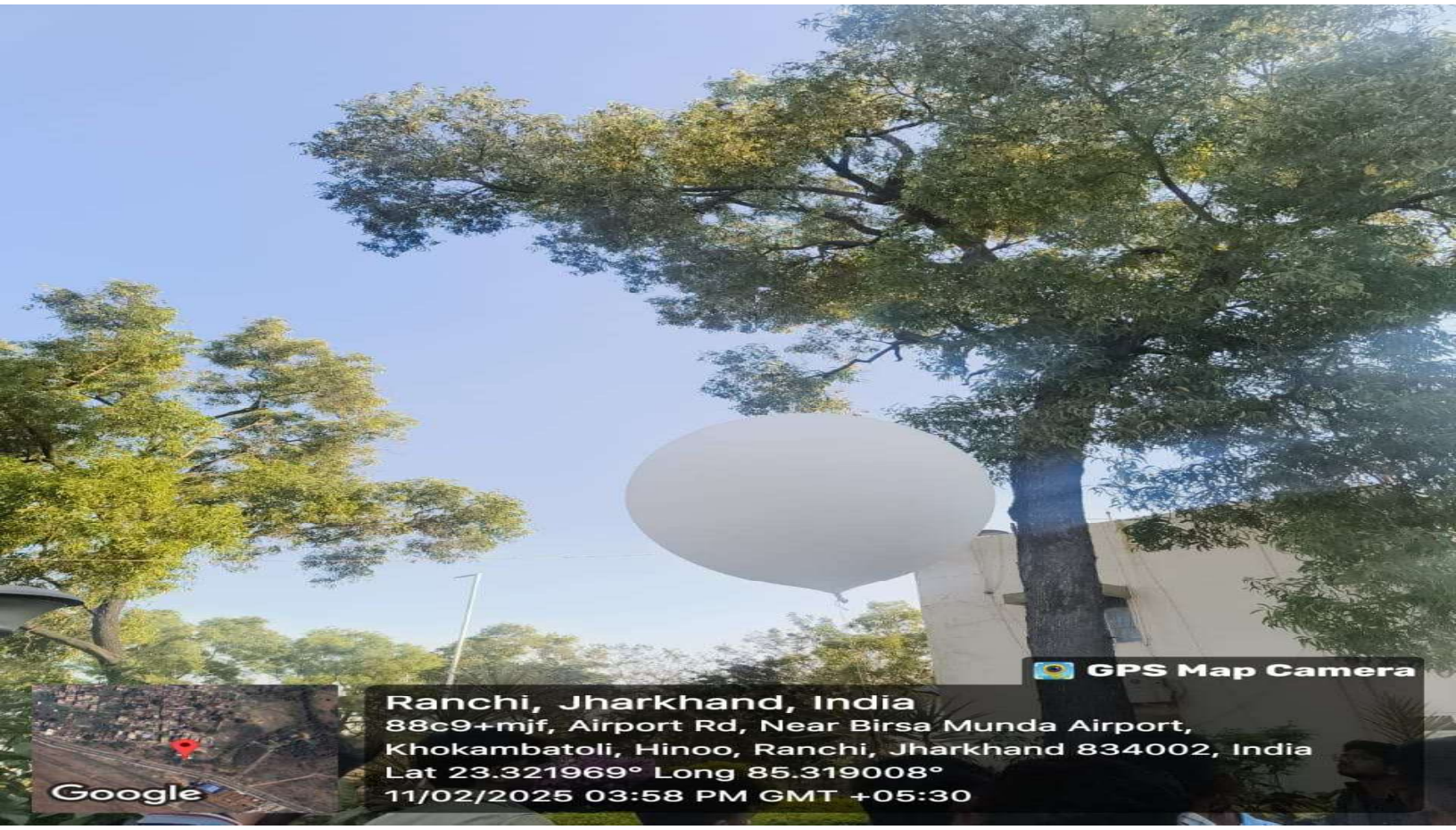
6.Hydrology and Flood Forecasting:

By monitoring rainfall and river flow, IMD contributes to flood forecasting and water management systems.

Technological Infrastructure

IMD has adopted advanced tools and technologies to improve the accuracy and reliability of its forecasts. It uses **Doppler Weather Radars (DWRs)**, **automatic weather stations**, and data from Indian and international **weather satellites** such as **INSAT-3D/3DR**. The department also uses **Numerical Weather Prediction (NWP)** models and high-performance computing systems to simulate and analyze weather patterns.

Through its **mobile apps** (like *Mausam* and *Meghdoot*) and web portals, IMD reaches millions of users with real-time updates and alerts.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Good [morning/afternoon], everyone. Today, I'll briefly talk about the India Meteorological Department, commonly known as IMD.The India Meteorological Department (IMD) was established in 1875 and is the national agency responsible for weather forecasting, climate monitoring, and seismology in India. It functions under the Ministry of Earth Sciences.IMD's primary role is to provide accurate weather forecasts and early warnings for extreme weather events such as cyclones, floods, heavy rainfall, heatwaves, and cold waves. These warnings are crucial in protecting lives and property, especially in disaster-prone areas.With its headquarters in New Delhi, IMD operates a vast network of weather stations, Doppler weather radars, and satellite systems across the country. It uses modern technology like Numerical Weather Prediction models and data from INSAT satellites to improve the accuracy of forecasts.

Observation Details in IMDThe India Meteorological Department (IMD) conducts a wide range of meteorological, hydrological, and seismological observations across the country. These observations form the foundation for accurate weather forecasting, climate monitoring, and disaster alerts.Types of Observations:Surface Observations:Collected through ground-based weather stations.Measure temperature, humidity, rainfall, wind speed/direction, and atmospheric pressure.Taken every hour or half-hour at key locations.Upper Air Observations:Conducted using weather balloons (radiosondes) and pilot balloons.Measure temperature, humidity, and wind at various altitudes.Essential for understanding the atmosphere’s vertical profile.Radar Observations:IMD uses Doppler Weather Radars (DWRs) to detect:Rainfall intensityThunderstormsCyclonesData updated every 10 minutes and used for real-time alerts.

BIG STEVENSON SCREEN

Significance of the Study

The study of the **India Meteorological Department (IMD)** holds immense importance in understanding the critical role that meteorological services play in the sustainable development and safety of a nation. As India faces an increasing frequency of extreme weather events—such as cyclones, floods, droughts, heatwaves, and unseasonal rains—this study helps highlight how timely and accurate weather forecasts can help save lives, reduce economic losses, and support effective disaster management.

The IMD plays a pivotal role in the **agricultural sector**, which is the backbone of the Indian economy and highly dependent on monsoon rains. The department provides agro-meteorological advisories that help farmers make informed decisions regarding sowing, irrigation, and harvesting. By studying IMD's services and forecasting accuracy, stakeholders can evaluate how to further improve agricultural resilience and productivity.

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In the field of **aviation, marine, and public transport**, IMD ensures operational safety through real-time weather alerts and warnings. The study is significant in assessing how technological upgrades—such as the use of Doppler radars and satellite data—have enhanced the department's forecasting abilities. This is particularly crucial for coastal regions that are vulnerable to cyclones and tsunamis. Moreover, the study emphasizes IMD's contribution to **climate monitoring and environmental awareness**. With global concerns about climate change and its impacts, understanding IMD's role in tracking long-term weather patterns and contributing to global climate databases becomes essential. It also encourages the integration of science-based evidence in policy-making and sustainable development planning.

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Observation Details of the India Meteorological Department (IMD)

The **India Meteorological Department (IMD)** is responsible for conducting and maintaining a wide range of atmospheric, oceanic, and seismic observations across the country. These observations form the scientific foundation for weather forecasting, climate studies, and disaster early warning systems.

IMD collects observational data using an extensive network of **ground stations, weather radars, satellites, balloons, and seismic instruments**. These observations are recorded at regular intervals and analyzed through advanced meteorological models to predict weather patterns and issue warnings.

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1. Surface Observations

- **Instruments used**: Thermometers, barometers, anemometers, rain gauges.
- **Data collected**: Temperature, humidity, rainfall, wind speed and direction, atmospheric pressure.
- **Frequency**: Hourly or three-hourly intervals.
- **Purpose**: Essential for day-to-day weather reporting and forecasting.

08 14 on 12/2/2025
ONE DIVISION=0.5mm OF RAINFALL

2. Upper Air Observations

- **Tools**: Radiosondes and Pilot Balloons.
- **Data collected**: Vertical profiles of temperature, pressure, humidity, and wind.
- **Use**: Helps in understanding the structure and dynamics of the atmosphere at different heights—critical for accurate weather modeling and cyclone tracking.

3. Radar Observations

•**Equipment**: Doppler Weather Radars (DWRs).
•**Coverage**: IMD operates over 30 DWR stations.
•**Data collected**: Real-time detection of rainfall intensity, thunderstorm movement, and cyclone structure.
•**Frequency**: Updated every 10 to 15 minutes.
•**Importance**: Crucial for issuing short-term forecasts (nowcasting) and early warnings for severe weather events.

तकनीकी अनुभाग
TECHNICAL SECTION

Suggestions for the India Meteorological Department (IMD)

1. Enhance Local-Level Forecasting

•IMD should focus on providing **district and village-level forecasts** in regional languages to make weather information more accessible and actionable for rural populations, especially farmers.

2. Expand Radar and Observation Network

•Increase the number of **Doppler Weather Radars (DWRs)** and **automatic weather stations (AWS)**, particularly in remote and coastal areas, for better real-time coverage and forecasting accuracy.

3. Strengthen Public CommunicationUse SMS alerts, mobile apps, social media, and community radio to improve the reach and clarity of weather warnings.Ensure weather alerts are simplified and easy to understand for the general public.4. Promote Weather LiteracyLaunch public awareness campaigns and school programs to educate citizens about reading weather warnings, disaster preparedness, and climate change impacts.

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Conclusion

The **India Meteorological Department (IMD)** stands as a cornerstone of India's efforts to understand and predict weather and climate. With its rich history, advanced technology, and extensive network of observation systems, IMD plays a vital role in safeguarding lives, supporting agriculture, ensuring transportation safety, and aiding disaster management across the country.

In an era marked by climate change and increasing extreme weather events, the importance of IMD's accurate forecasting and timely warnings cannot be overstated. Continuous advancements in technology and communication are essential for enhancing the department's reach and effectiveness.

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Certificate:

This is to certify that student of geography department Ba sem 5 . bearing exam roll no -22AGEO052401 has completed this project on study of weather instruments (IMD).As a part of practical paper.

Professor in charge

signature:-
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